

BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 3

MARCH 1957

PART 19

INSTITUTE NEWS

Spring Meeting, London, 29 April–3 May

The 1957 Spring Meeting of the Institute will be held in London from Monday to Friday 29 April–3 May and will be a joint meeting with the Associazione Italiana di Metallurgia, Association Suisse pour l'Essai des Matériaux, and the Société Suisse des Constructeurs de Machines. Members of the Iron and Steel Institute are also being invited to take part. There will be an extension of the meeting for the members of the Italian and Swiss societies from Saturday to Wednesday, 4–8 May, when works and laboratories in the provinces will be visited.

Members of the Institute of Metals have been very warmly received and generously entertained at Autumn Meetings in both Switzerland and Italy, and the Institute welcomes this opportunity to return the hospitality its members enjoyed on those occasions.

The Council is looking forward to a very successful meeting and hopes members will give it full support, especially by attending, with their friends, the Cocktail Party and the Banquet and Dance given in honour of the members of the visiting societies.

The programme arranged for the meeting should prove of interest to members engaged in widely differing fields of work, and it is hoped that there will be large attendances at the meetings and discussions.

All members resident in Europe will receive a Reply Form for completion in connection with the meeting. Other members, resident outside Europe, who wish to be present should apply to the Secretary for a Reply Form.

All members who intend to take any part in the meeting are asked to notify the Secretary, so that they may be issued with meeting badges bearing their name; these badges are helpful to other members and to our foreign guests, and will facilitate introductions.

PROGRAMME

Monday, 29 April

Location: Church House, Great Smith Street, Westminster, S.W.1.

9.30 a.m. to 6.0 p.m. *REGISTRATION* of members of the Associazione Italiana di Metallurgia, Association Suisse pour l'Essai des Matériaux, Société Suisse des Constructeurs de Machines. Issue of tickets, meeting badges, literature, maps, &c.

2.0 p.m. to 5.30 p.m. *COACH TOUR IN LONDON*, by invitation of the Institute of Metals, for members and ladies of the Associazione Italiana di Metallurgia, Association Suisse pour l'Essai des Matériaux, and Société Suisse des Constructeurs de Machines. Visits will be paid in the City to the Tower of London (including the Crown Jewels), Mansion House and Guildhall, with Italian- and German-speaking guides.

or

2.0 p.m. *VISITS* for members of the Italian and Swiss Societies, by invitation, to one of the following works or laboratories (transport provided by the Institute of Metals):

(i) The British Non-Ferrous Metals Research Association Laboratories, Euston Street, London, N.W.1 (co-operative industrial research for the non-ferrous industry).

or

(ii) The British Iron and Steel Research Association Laboratories, Battersea, London, S.W.1 (Plant Engineering Division, Physics Department and Chemistry Department, including Corrosion Laboratory).

or

(iii) High Duty Alloys, Ltd., Slough (aluminium and aluminium alloy hand- and machine-moulded sand castings, gravity die-castings, and pressure die-castings; and the Company's Research Laboratories).

or

(iv) The Mond Nickel Co., Ltd., Acton (precious metal refinery and laboratories).

Location: Royal Institution, Albemarle Street, London, W.1.

6.30 p.m. *OPENING CEREMONY*. Welcome to members and ladies of the Italian and Swiss Societies.

7.0 p.m. *MAY LECTURE*, on "Education in Science and Technology", by Sir ERIC ASHBY, D.Sc., Sc.D. (President and Vice-Chancellor, The Queen's University of Belfast).

8.30 p.m. for 8.45 p.m. *DINNER PARTY* (men only) at which the Presidents and Members of Council of the Italian and Swiss Societies, the May Lecturer, and other distinguished delegates will be guests of the Institute of Metals.

INSTITUTE NEWS

Tuesday, 30 April

Morning

Location: Church House, Great Smith Street, Westminster, S.W.1.

9.30 a.m. to 5.0 p.m. REGISTRATION of members of the Italian and Swiss Societies.

PROGRAMME "A"

10.0 a.m. VISIT for members and ladies of the Italian and Swiss Societies, by invitation of the Institute of Metals, to: Westminster Abbey, the Chapels, Muniment Room, and Cloisters (with Italian- and German-speaking guides).

PROGRAMME "B"

9.30 a.m. ANNUAL GENERAL MEETING of the Institute of Metals:

- (a) Election of officers.
- (b) Report of Council for the Year Ended 31 December 1956.
- (c) Report of the Honorary Treasurer for the Financial Year Ended 30 June 1956.
- (d) Installation of New President, Dr. L. B. PFEIL, O.B.E., A.R.S.M., F.I.M., F.R.S.
- (e) Vote of Thanks to Retiring President.
- (f) Presentation of Institute Medals.
- (g) Presidential Address, by Dr. L. B. PFEIL, O.B.E., A.R.S.M., F.I.M., F.R.S.

12 noon. COCKTAIL PARTY, in the Hoare Memorial Hall, Church House, given by the Institute of Metals, to meet members and ladies of the Italian and Swiss Societies. (Tickets, price 12s. 6d.)

Afternoon

PROGRAMME "A"

2.0 p.m. VISITS for members of the Italian and Swiss Societies and, where marked *, also for members of the Institute of Metals and Iron and Steel Institute (transport provided by the Institute of Metals).

(i) The British Aluminium Co., Ltd., Research Laboratories, Gerrards Cross.

or

*(ii) The General Electric Co., Ltd., Fraser and Chalmers Engineering Works, Erith (steam turbines, mining equipment, conveyor plants, fuel preparation plant, &c.).

or

*(iii) Frederick Braby and Co., Ltd., Crayford (galvanizing, manufacture of sheet, plate, and sectional products).

or

*(iv) Telegraph Construction and Maintenance Co., Ltd., and Submarine Cables, Ltd. (manufacture of land and under-sea telephone and telegraph cables).

PROGRAMME "B"

Location: Church House, Great Smith Street, Westminster, S.W.1.

2.30 p.m. DISCUSSION on: "The Metal Physics of Corrosion and Oxidation".

Evening. RECEPTION, by His Excellency the Swiss Minister at his residence, 21 Bryanston Square, W.1.

Wednesday, 1 May

Morning

10.0 a.m. VISIT for members and ladies of the Italian and Swiss Societies (accompanied by Italian- and German-speaking guides) to the National Gallery, by invitation of the Institute of Metals.

Location: Church House, Great Smith Street, Westminster, S.W.1.

9.30 a.m. to 5.0 p.m. REGISTRATION of delegates and guests.

PROGRAMME "A"

9.30 a.m. SYMPOSIUM on "Metallurgical Aspects of the Control of Quality in Non-Ferrous Castings" (arranged by the Metallurgical Engineering Committee, in conjunction with the Institute of British Foundrymen), based on the following papers published in the *Journal*. (Rapporteur: Dr. W. A. BAKER, F.I.M.)

(a) RUDDLE and CIBULA: "The Metallurgical Principles of the Control of Quality of Non-Ferrous Castings" (No. 1749; March 1957).

(b) MARTIN: "The Role of Statistical Methods in Controlling the Quality of Non-Ferrous Castings" (No. 1744; Feb. 1957).

(c) CARLESS: "Metallurgical Control of Quality in the Production of Aluminium Alloy Castings" (No. 1745; Feb. 1957).

(d) FRENCH: "The Metallurgical Control of Quality in the Production of Copper-Base Alloy Castings" (No. 1750; March 1957).

(e) EMLEY and FISHER: "The Control of Quality of Magnesium-Base Alloy Castings" (No. 1746; Feb. 1957).

(f) WOOD and GREGG: "Control of Quality in the Production of Nickel Alloy Sand Castings" (No. 1751; March 1957).

(g) SHARP: "The Control of Quality of Pressure Die-Castings" (No. 1752; March 1957).

(h) FRY: "Non-Destructive Testing for Quality Control of Non-Ferrous Castings" (No. 1754; April 1957).

PROGRAMME "B"

10.0 a.m. SCIENTIFIC SESSION

Theme: THE METALLURGY OF NIOBIUM. A discussion (arranged by the Nuclear Energy Committee) based on the following papers to be published in the April *Journal*:

(a) MCINTOSH: "Development of Niobium".

(b) O'DRISCOLL and MILLER: "The Purification of Niobium by Sintering".

(c) WILLIAMS: "The Production and Fabrication of Massive Niobium Metal".

(d) TOTTLE: "The Physical and Mechanical Properties of Niobium".

(e) SCHOFIELD: "The Melting Point of Niobium".

Afternoon

PROGRAMME "A"

2.30 p.m. *SYMPOSIUM* on "Metallurgical Aspects of the Control of Quality in Non-Ferrous Castings" (continued).

PROGRAMME "B"

2.30 p.m. *SCIENTIFIC SESSION*

Theme: LIQUID METALS. A discussion based on the following papers published in the *Journal*. (*Rapporteur: Dr. IVOR JENKINS, F.I.M.*)

(a) STRACHAN and HARRIS: "The Attack of Unstressed Metals by Liquid Mercury" (No. 1715; Sept. 1956).

(b) JORDAN and MILNER: "The Removal of Oxide from Aluminium by Brazing Fluxes" (No. 1718; Oct. 1956).

(c) WARD and TAYLOR: "Solution-Rate Studies with Liquid Metals: Solution of Copper in Liquid Lead and Bismuth" (No. 1734; Dec. 1956).

(d) MELFORD and HOAR: "Determination of the Surface Tensions of Molten Lead, Tin, and Indium by an Improved Capillary Method" (No. 1742; Jan. 1957).

Evening. *RECEPTION* for members and ladies of the Italian and Swiss societies and representatives of British metallurgical science and industry.

Thursday, 2 May

PROGRAMME "A"

9.30 a.m. *ALL-DAY VISITS* for members and ladies of the Italian and Swiss Societies to:

Ladies and Men:

(i) Windsor Castle (lunch at the White Hart Hotel); St. George's Chapel, Windsor; and Eton College by invitation of the Institute of Metals, accompanied by Italian- and German-speaking guides.

or

Men only:

(ii) The General Electric Co., Ltd., Wembley (Research Laboratories and Glass Works). Lunch by invitation of the Company.

or

(iii) The A.P.V. Company, Ltd., and A.P.V. Paramount, Ltd., Crawley (press, machine, and fitting shops for manufacture of plate heat-exchangers, &c., in stainless steel; stainless-steel pipe fittings; aluminium, gun-metal, and stainless-steel foundries). Lunch by invitation of the Companies.

PROGRAMME "B"

Location: 17 Belgrave Square, London, S.W.1.

SCIENTIFIC SESSION.

10.0 a.m. A.—*Theme: Magnesium-Lithium Alloys.* A discussion based on the following papers published in the *Journal*:

(a) JONES: "The Mechanical Properties of Binary and Ternary Magnesium Alloys Containing Lithium" (No. 1696; June 1956).

(b) TOAZ and RIPLING: "Flow and Fracture Characteristics of Binary Wrought Magnesium-Lithium Alloys" (No. 1733; Dec. 1956).

(c) JONES and HOGG: "The Stability of Mechanical Properties of Beta-Phase Magnesium-Lithium Alloys" (No. 1747; Feb. 1957).

11.30 a.m. (approx.). B.—*Theme: Effect of Composition on the Stress-Corrosion of Aluminium Alloys.* A discussion based on the following papers published in the *Journal*:

(a) CHADWICK, MUIR, and GRAINGER: "Stress Corrosion of Wrought Ternary and Complex Alloys of the Aluminium-Zinc-Magnesium System" (No. 1737; Jan. 1957).

(b) DAY: "Note on the Effect of Additions of Manganese and Chromium on the Microstructure of D.T.D. 687 A-Type Alloys" (No. 1748; Feb. 1957).

1.0 p.m. (approx.). Conclusion of Session.

7.15 p.m. for 7.45 p.m. *BANQUET AND DANCE* in the Great Room, Grosvenor House, Park Lane, London, W.1, at which the members and ladies of the Associazione Italiana di Metallurgia, Association Suisse pour l'Essai des Matériaux, and Société Suisse des Constructeurs de Machines will be the guests of the Institute of Metals. (Dress: evening dress, with decorations.) Dancing, at the conclusion of the Banquet, until 1.0 a.m. Tickets, price 40s., exclusive of wine but inclusive of coffee and gratuities.

Friday, 3 May

ALL-DAY VISITS (except where otherwise stated) for members and ladies of the Italian and Swiss Societies and of The Institute of Metals and The Iron and Steel Institute.

Ladies and Members:

(i) Cambridge (the Colleges and other places of interest). Lunch at the University Arms Hotel. (Members of the Italian and Swiss societies will be the guests of the Institute of Metals on this visit.)

Men only:

(ii) Associated Electrical Industries, Ltd., Research Laboratories, Aldermaston (long-term fundamental work for the A.E.I. Group of 8 Companies). (Lunch by invitation.)

or

(iii) Enfield Rolling Mills, Ltd., Brimsdown (copper refinery; copper rod mill; copper and brass sheet mill; zinc sheet mill). (Lunch by invitation of the Company.)

or

(iv) Ford Motor Co., Ltd., Dagenham (blast furnace, sinter plant, coke ovens, foundry, rolling mill, machine shop and engine, motor car and tractor assembly). (*Small party only: Half-day visit.*)

or

(v) Northern Aluminium Co., Ltd., Banbury, and Aluminium Laboratories, Ltd., Banbury (fabrication of semi-finished aluminium products—sheet mill and extrusion presses; manufacture of paste. The

laboratories undertake research on the fabrication and use of aluminium and its alloys). (Lunch by invitation of the Company.)

or

(vi) Stewarts and Lloyds, Ltd., Corby (a modern, integrated undertaking, in which the end-products are welded and seamless tubes. Ore preparation, blast furnaces, and coke ovens; basic Bessemer, open-hearth and electric steel making; slabs, sheets and billets; strip mill; tube making; continuous weld plant). (Lunch by invitation of the Company.)

Evening. Free in London.

Saturday, 4 May

Morning. Free in London.

Afternoon. Members and ladies of the Italian and Swiss societies leave London for provincial centres, at which a limited amount of hotel accommodation has been reserved by Thos. Cook and Son, Ltd.:

(a) *Birmingham* (Welcombe Hotel, Stratford-on-Avon).

(b) *Sheffield* (Royal Victoria Hotel).

(c) *South Wales* (Seabank Hotel, Porthcawl).

PROVINCIAL VISITS

(For delegates and ladies of the Italian and Swiss societies.)

I.—BIRMINGHAM

Sunday, 5 May

Morning. Visit to Stratford-on-Avon (with Italian- and German-speaking guides), including Shakespeare's Birthplace, Ann Hathaway's Cottage, &c.

Monday, 6 May

Men: All-Day Visits to

(i) Imperial Chemical Industries, Ltd., Metals Division, Witton (Works and Laboratories). (Lunch by invitation of the Company.)

or

(ii) The General Electric Co., Ltd., Witton. (Lunch by invitation of the Company.)

Ladies: All-Day Visit to Warwick Castle and Broadway.

Evening. *Dinner* by invitation of the British Non-Ferrous Metals Federation (day dress).

Tuesday, 7 May

Men: All-Day Visits to

(i) Henry Wiggin and Co., Ltd. (Works) and Development and Research Laboratories of The Mond Nickel Co., Ltd. (Lunch by invitation of the Company.)

or

(ii) (a) Accles and Pollock, Ltd., Oldbury (seamless precision steel tubes). (Lunch by invitation of the Company.)

and

(b) Joseph Lucas, Ltd., Shaftsmoor Lane Works (lamps, dynamos, and starters).

II.—SHEFFIELD

Sunday, 5 May

All Day. Tour, by coach, in Derbyshire, with lunch at the Peacock Hotel, Rowsley, by invitation of the Institute of Metals.

Monday, 6 May

Men:

All Day. All-day visits to steel plants, in small parties, by arrangement.

Davy and United Engineering Co., Ltd., Park Iron Works, Sheffield (heavy engineering: building rolling mills, forging presses and associated machinery).

Ladies:

Visits to places of interest locally, with lunch, by invitation of the Institute of Metals.

Tuesday, 7 May

Men:

Morning. Visits to steel plants, in small parties, by arrangement.

Afternoon. Research Laboratories of the British Iron and Steel Research Association.

(Note: It is hoped that Italian and Swiss delegates will express the desire to visit particular steel works in the Sheffield area, in which case the Institute of Metals will endeavour to arrange for small parties.)

III.—SOUTH WALES

Sunday, 5 May

All Day. Coach tour in the Wye Valley, with lunch, by invitation of the Institute of Metals.

Monday, 6 May

Men:

All Day. Visit to the Abbey and Margam Works of The Steel Company of Wales, Ltd., with lunch by invitation of the Company.

Ladies:

All-day coach tour in the Gower Peninsula, with lunch, by invitation of the Institute of Metals.

Tuesday, 7 May

Men:

Morning. Visit to Trostre Tinplate Works of The Steel Company of Wales, Ltd. Lunch by invitation.

Afternoon. Visit to the Sketty Hall Research Laboratories of the British Iron and Steel Research Association.

IV.—CALDER HALL

Wednesday, 8 May

A half-day visit to the Calder Hall atomic energy station can be arranged for Wednesday, 8 May, for any Italian or Swiss delegates who desire it and who give early notification of their wish. The train journey is a very long one from London or the provincial centres, and this visit is *not* recommended unless specially desired, because of difficulties of travel and accommodation, and the limited period (half-day) of the visit.

Admission of the Institute to the British Nuclear Energy Conference

At a meeting of the Board of the British Nuclear Energy Conference, under the Chairmanship of Sir John Cockcroft, O.M., K.C.B., F.R.S., it was decided on 9 January 1957 to admit to membership The Iron and Steel Institute and The Institute of Metals.

The purpose of the British Nuclear Energy Conference is to co-ordinate the activities of the constituent members in the field of nuclear energy by holding meetings and publishing a journal. The recent "Symposium on Calder Hall", held at the Central Hall, Westminster, was attended by 1800 delegates from countries throughout the world.

The original constituent members of the B.N.E.C. were The Institutions of Civil, Mechanical, and Electrical Engineers, The Institute of Physics, and The Institution of Chemical Engineers. It had for some time been felt that the organization would be strengthened by including representatives from the field of metallurgy.

Members of the Institute are entitled to attend meetings sponsored by the Conference at any of the other six constituent societies, and to receive the quarterly *Journal of the British Nuclear Energy Conference* at half price, viz. 30s. per annum. Subscriptions to the *Journal* should be sent direct to the Secretary of the British Nuclear Energy Conference, 1-7 Great George Street, London, S.W.1.

Election of Members

The following 8 Ordinary Members, 6 Junior Members, and 7 Student Members were elected on 8 February 1957:

As Ordinary Members

- BIANCHI, Professor Giuseppe, Istituto di Chimica Fisica, Università di Modena, 19 Via S. Eufemia, Modena, Italy.
- COWIE, James, Metallurgist, Laboratories, The General Electric Co., Ltd., Witton, Birmingham 6.
- DAKIN, Eric McEwan, A.M.C.T., Director and Chief Engineer, Ferguson Pailin, Ltd., Higher Openshaw, Manchester 11.
- LINDSAY-CARL, Laurie William, L.I.M., Assistant Chief Metallurgist, A.E.C., Ltd., Southall, Middx.
- SCANLAN, James Vincent, Works Metallurgist, High Duty Alloys, Ltd., Redditch, Worcs.
- SUMNER, Archibald Newall, A.I.M., Metallurgist, The British Cast Iron Research Association, Blantyre Industrial Estate, Blantyre, Glasgow.
- TAYLOR, Albert Major, A.Met., A.I.M., Research Metallurgist, English Electric Co., Ltd., Cambridge Road, Whetstone, Leicester.
- TUGWELL, Gilbert Leonard, Managing Director, Baker Platinum Division, Engelhard Industries, Ltd., 52 High Holborn, London, W.C.1.

As Junior Members

- BANGAY, Alan John, Experimental Officer, Metallurgy Department, British Insulated Callender's Cables, Ltd., 38 Wood Lane, London, W.12.
- GROUCOTT, Leslie, B.Met., Junior Metallurgist, Research Department, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17.
- JEPSON, Walter Brian, B.Sc., Ph.D., A.R.I.C., Department of Chemistry, University of Exeter, Washington Singer Laboratories, Prince of Wales Road, Exeter.

KITTL, Jorge, B.Sc., Chemical Engineer, Comisión Nacional Energía Atómica, Buenos Aires, Argentina.

MAZZA, JORGE A., B.Sc., Chemical Engineer, Comisión Nacional Energía Atómica, Buenos Aires, Argentina.

SMITH, Anthony Albert, B.Sc., Assistant Metallurgist, Research Laboratories, British Insulated Callender's Cables, Ltd., 38 Wood Lane, London, W.12.

As Student Members

AVERY, Maurice Reginald, Student of Metallurgy, Wandsworth Technical College; Assistant (Scientific), Armament Research and Development Establishment, Woolwich Arsenal, London, S.E.18.

BAIRD, Colin, Part-Time Student, County Technical College, Wednesbury.

BINDER, Peter, Undergraduate, Department of Metallurgy, King's College, Newcastle-on-Tyne.

CAMERON, Alan Duncan, Student of Metallurgy, Wandsworth Technical College; Laboratory Assistant, The Fairey Aviation Co., Ltd., Hayes, Middx.

HAWKES, Leonard Geoffrey, Student of Metallurgy, Wandsworth Technical College; Trainee Metallurgist, London and Scandinavian Metallurgical Co., Ltd., Gonsalva Road, London, S.W.8.

KERBEY, Brian William, Student of Metallurgy, Wandsworth Technical College; Trainee Metallurgist, London and Scandinavian Metallurgical Co., Ltd., Gonsalva Road, London, S.W.8.

WINTER, Joseph, B.Mech.E., M.S., Post-Graduate Student, New York University, College of Engineering, New York 53, N.Y., U.S.A.

PERSONAL NOTES

MR. R. D. ABBOTT has left the Research Laboratories of The General Electric Co., Ltd., and has been appointed Senior Metallurgist, Hoover, Ltd., Perivale, Greenford, Middlesex.

MR. K. BROMAGE has left J. Stone and Co. (Charlton), Ltd., and is now an Assistant Technical Officer in the Titanium Process Development Department of Imperial Chemical Industries, Ltd., Birmingham.

MR. E. G. EELES has received the Ph.D. degree of the University of Birmingham.

DR. U. R. EVANS is to deliver the 1957 Hothersall Memorial Lecture to the Institute of Metal Finishing.

MR. R. W. FLOYD has left High Duty Alloys, Ltd., to become Senior Metallurgist in the Metallurgical Department of Henry Wiggin and Co., Ltd.

MR. L. W. GRAHAM has been awarded the Ph.D. degree of Manchester University, and has now joined Hawker-Siddeley Nuclear Co., Ltd., Langley, Bucks.

PROFESSOR W. KÖSTER, one of the Corresponding Members to the Council for Germany, has been awarded the honorary degree of Dr.Ing. of the Technische Hochschule, Berlin.

DR. M. VAN LANCKER has been designated Laureate in the competition organized by the Union Minière du Haut-Katanga on the occasion of the 50th anniversary of the company's foundation.

Dr. R. MADDIN, Professor of Metallurgy at the University of Pennsylvania, has been appointed Director of the School of Metallurgical Engineering there.

Mr. M. K. MADHEKAR was recently awarded the Ph.D. degree of Manchester University and has now returned to India.

Dr. J. B. MARRIOTT has left Associated Electrical Industries, Ltd., Aldermaston, to join Shaw-Petrie, Ltd., North Hillington, Glasgow.

Dr. T. B. MASSALSKI has left the Institute for the Study of Metals, Chicago, and has returned to England.

Dr. D. C. MOORE, jointly with Mr. E. A. Taylor, has been awarded the Sir William J. Larke Medal for 1956 by the Institute of Welding. Their paper on "The Welding of

LETTERS TO THE EDITOR

Fine Slip and Fatigue Cracking

It was suggested in a recent note¹ that surface fatigue cracks could result simply from the geometry of slip movements in fatigue deformation. The peculiarities of fatigue slip movements are that: (a) they are fine, since the alternating plastic strains are small; (b) they tend to concentrate in bands, at which the cracks usually begin; and (c) they are naturally to-and-fro movements. The suggestion, based on these features, was that the to-and-fro slip movements in a band could build up at the surface any irregular contour according to their distribution across the band; and that, in particular, they could build up a notch, which, as it deepened, could readily start a crack.

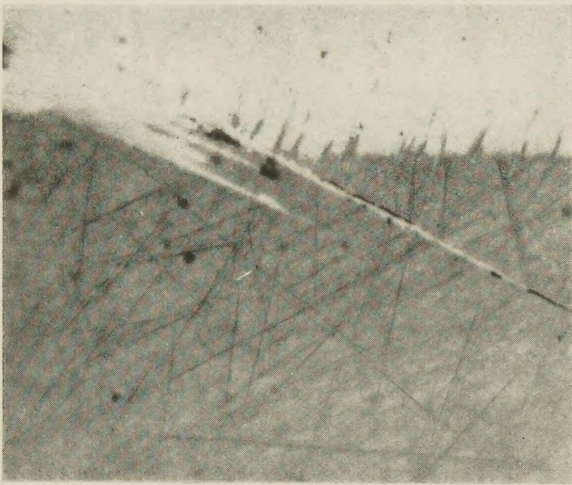


FIG. 1.—Unetched Specimen

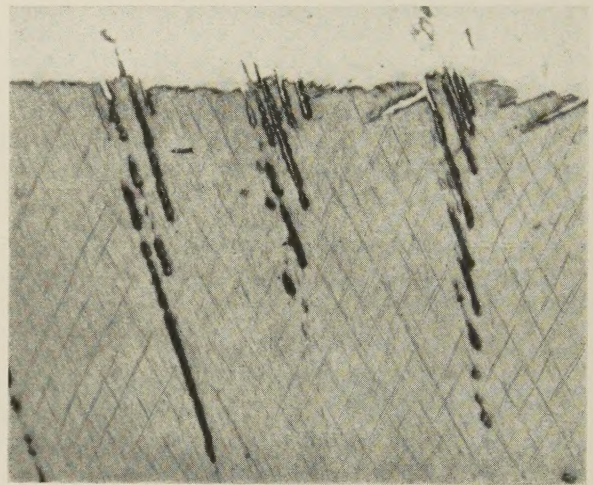


FIG. 2.—Etched Specimen

FIGS. 1 and 2.—Copper Specimens Subjected to Alternating Torsion and Electroplated with Silver. Magnification 30×500 .

Copper and Copper Alloys" was adjudged the paper of the highest merit among those presented to the Institute during the year.

Mr. F. W. NEWELL has taken up a post at the Fundamental Research Laboratories, Triplex Safety Glass Co., Ltd., Balsall Common, Warwickshire.

Mr. FRANK ROWE has been appointed a Director of The George Cohen 600 Group, Ltd. He will continue to hold his position of Managing Director of the subsidiary company, K. and L. Steelfounders and Engineers, Ltd.

PROFESSOR E. SCHMID, Corresponding Member to the Council for Austria, has been awarded the honorary degree of Dr. mont. of the Montanistische Hochschule, Leoben.

Mr. R. TATE has left Trans-Canada Airlines to take up the position of Materials and Processes Engineer with Canadian Pacific Airlines, Vancouver, B.C.

Mr. N. T. WILLIAMS has left the Research Department, Bristol Aero-Engines, Ltd., and is now carrying out post-graduate research in the Department of Metallurgy at University College, Swansea.

Experiments have been made to test this view by determining the surface contour developed across typical bands. Thus an electropolished specimen is subjected to fatigue deformation until slip bands are obtained, and the surface is then protected by an electrodeposited layer. A taper section is taken which makes an angle with the specimen surface of about 3° , so conferring on contour changes perpendicular to the surface a geometrical magnification of about 30 times. Observation by microscope after mechanically polishing the section is then made at magnifications of 500 to 1500 times, which, multiplied by the geometrical magnification of 30, appears sufficient to show up the surface disturbances.

Enough photographs under various conditions have now been obtained to establish the validity of the method and to confirm the contour changes predicted. Examples are provided by Figs. 1 and 2 from a copper specimen subjected to alternating torsion and electroplated with silver, which shows up white (magnification 30×500). Fig. 1 shows a notch-like contour from which a crack appears to be developing. This section was not etched after polishing. Etching of the copper brings up what appear to be slip bands within the metal, and as a result shows how the jagged contour at the surface is related to these bands. This is illustrated, in another

section, by Fig. 2. It will be seen that these contours contain ridges as well as notches. These would account for the development of debris in the slip bands as observed many years ago by Ewing and Humfrey² and for the extrusion effects observed recently by Forsyth and Stubbington.³

W. A. WOOD
R. L. SEGALL

Baillieu Laboratory,
University of Melbourne,
Australia.

REFERENCES

1. W. A. Wood, *Bull. Inst. Metals*, 1955, 3, (1), 5.
2. J. A. Ewing and J. W. C. Humfrey, *Phil. Trans. Roy. Soc.*, 1903, [A], 200, 241.
3. P. J. E. Forsyth and C. A. Stubbington, *J. Inst. Metals*, 1954-55, 83, (8), 395.

Molybdenum-Rhenium System

Work by McHargue and Maynor¹ suggested that a face-centred cubic phase exists in the system molybdenum-rhenium. They reported it in an alloy containing 25 wt.-% rhenium. The existence of this phase has not been confirmed in a study of the system made in this Laboratory, during which arc-melted alloys containing 0-100% rhenium have been studied between 900° C. and their melting points.

The solubility of rhenium in molybdenum is 42 at.-% at 2400° C., falling to 27 at.-% at 1000° C. Arc-melted alloys with rhenium contents between 30 and 40 at.-% rhenium are exceedingly ductile,² unlike arc-melted molybdenum.

Two intermediate phases are present in the system, one having the sigma structure^{3, 4} and the other being of the α -manganese type.⁴ The sigma phase is produced by a peritectic reaction at c. 2500° C. between the rhenium solid solution and liquid, and has a homogeneity range from 50 to 74 at.-% rhenium. The phase with the α -manganese structure forms peritectoidally at 1850° C. from sigma and rhenium-rich solid solution at about 80 at.-% rhenium. The maximum solubility of molybdenum in rhenium is 14 at.-%.

Evidence obtained by annealing supersaturated molybdenum-rich solid solutions suggests that sigma is stable only above 1200° C., the α -manganese compound being precipitated below this temperature.

A full account of the study of the molybdenum-rhenium system will be published at a later date.

The writer wishes to thank Dr. G. A. Geach for his interest in the work and Dr. T. E. Allibone, F.R.S., Director of the Research Laboratory, Associated Electrical Industries, Ltd., for permission to publish this letter.

A. G. KNAPTON

Research Laboratory,
Associated Electrical Industries, Ltd.,
Aldermaston, Berks.

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2. G. A. Geach and J. E. Hughes, *Plansee Proc.*, 1955, 5, 245.
3. A. G. Knapton, *Bull. Inst. Metals*, 1955, 3, 21.
4. P. Greenfield and P. A. Beck, *J. Metals*, 1956, 8, 265.

OTHER NEWS

Engineering, Marine, Welding, and Nuclear Energy Exhibition

This exhibition will be held at Olympia, London, W., from 29 August to 12 September 1957. The Honorary President will be Mr. W. K. G. Allen, M.I.Mar.E., A.M.I.N.A.

Conference on Physics of the Solid State

A Conference on Physics of the Solid State, organized by Professor L. F. Bates, F.R.S., will be held on Monday, Tuesday, and Wednesday, 8, 9, and 10 April 1957 in the Physics Department, The University of Nottingham.

Accommodation can be arranged in a Hall of Residence, preference being given to delegates requiring accommodation for the whole period Monday to Thursday morning.

Non-members of the Physical Society are welcome to attend this meeting on payment of a conference fee of 10s.

Requests for application forms, programmes, and all enquiries should be addressed to the Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W.7, marked for the attention of Miss Miles.

World Directory of Crystallographers

The International Union of Crystallography is considering the possibility of preparing a World Directory of Crystallographers. This list would contain the names and addresses of all practising crystallographers, including advanced graduate students. It is planned to compile a preliminary list in time for the Fourth General Assembly to be held in Montreal, 10-17 July 1957. The secretaries of the national committees (*Acta Cryst.*, 1955, 8, 857) have been asked to prepare a list of crystallographers in their countries. Some scientists and technologists, however, who carry on crystallographic work (including X-ray, electron, or neutron diffraction and microscopy or other techniques) are not members of scientific societies having a unique crystallographic interest, and might therefore be missed. Those who come into this category are asked to send their names and addresses, in printed letters, to Dr. William Parrish, Philips Laboratories, Irvington-on-Hudson, New York, U.S.A.

Symposium on "The Relation of Structure to High-Temperature Properties"

The High-Temperature Materials Committee of the Institute of Metals Division of the American Institute of Mining, Metallurgical, and Petroleum Engineers is sponsoring a symposium at the Second World Metallurgical Congress in Chicago in November 1957. The topic of the symposium is "The Relation of Structure to High-Temperature Properties". The committee is interested in receiving manuscripts dealing with the stability of microstructure at high temperatures, structural changes during high-temperature service, and the effect of different structures on high-temperature properties. Papers submitted to this symposium may also be submitted to the American Institute of Mining, Metallurgical, and Petroleum Engineers for publication in the usual manner. A 100-200-word abstract of papers for presentation should be sent to R. W. Guard, Alloy Studies, General Electric Research Laboratory, Schenectady, New York, by 15 May 1957.

DIARY

The Institute

- 29 April-3 May. Spring Meeting. (For details, see p. 155).

Local Sections and Associated Societies

- 2 April. Oxford Local Section. Annual General Meeting, followed by: "Fatigue", by Dr. N. Thompson. (Cadena Café, Cornmarket Street, Oxford, at 7.0 p.m.)
- 4 April. Leeds Metallurgical Society. "Fatigue in Metals", by P. J. E. Forsyth. (Large Chemistry Lecture Theatre, The University, Leeds 2, at 7.15 p.m.)
- 4 April. London Local Section. Annual General Meeting, followed by: "Recent Developments in Electron Microscopy", by Dr. J. Nutting. (17 Belgrave Square, London, S.W.1, at 6.0 p.m.)
- 11 April. Liverpool Metallurgical Society. "Vacuum Techniques in Metallurgy", by M. Harper, followed by the Annual General Meeting. (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.0 p.m.)
- 15 April. Sheffield Local Section. Films. (Engineering Lecture Theatre, The University, St. George's Square, Sheffield 1, at 7.30 p.m.)

Other Societies

- 3 April. Society of Chemical Industry, Corrosion Group. "The Protection of Structural Steel Against Corrosion", by J. C. Hudson. (Joint meeting with South Wales Section.) (Technical College, Newport, Mon., at 7.0 p.m.)
- 8 April. Society of Chemical Industry, Corrosion Group. Spring Lecture: "Corrosion Researches of Professor Piontelli and his Associates at Milan", by R. Piontelli. (Society of Chemical Industry, 14 Belgrave Square, London, S.W.1, at 6.30 p.m.)
- 9 April. East Midlands Metallurgical Society. "Nickel-Base Alloys for High-Temperature Service", by A. W. Franklin. (Nottingham and District Technical College, Nottingham, at 7.30 p.m.)
- 10 April. Institute of British Foundrymen, Southampton Section. Annual General Meeting and new film "Flow of Metal into Moulds", followed by open discussion of foundry problems. (Technical College, St. Mary's Street, Southampton, at 7.30 p.m.)
- 10 April. Society for Analytical Chemistry, Midlands Section. "The Analytical Chemistry of Beryllium", by E. Booth. (The University, Birmingham 3, at 7 p.m.)
- 11 April. Institute of British Foundrymen, Beds./Herts. Section. Annual General Meeting, followed by two films: "New Foundry Horizons" and "Plans for a New Foundry". (W. H. Allen, Sons & Co., Ltd., Bedford, at 7.30 p.m.)
- 12 April. Institute of Physics, Non-Destructive Testing Group. "Damping Capacity and Fatigue", by Dr. K. M. Entwistle. (47 Belgrave Square, London, S.W.1, at 6.30 p.m.)

- 12 April. West of Scotland Iron and Steel Institute. Annual General Meeting, followed by "Continuous Casting", by J. R. Rippon. (39 Elmbank Crescent, Glasgow, C.2, at 6.45 p.m.)
- 16 April. Institute of British Foundrymen, East Anglian Section. Annual General Meeting, followed by "Foundries and Foundry Management", by H. W. Keeble. (Lecture Hall, Public Library, Ipswich, at 7.15 p.m.)
- 17 April. Institute of British Foundrymen, London Branch. Annual General Meeting, followed by new film "Flow of Metal into Moulds" and discussion. (Constitutional Club, Northumberland Avenue, London, W.C.1, at 7 p.m.)
- 17 April. Royal Microscopical Society. "Modern Metallography and Some of its Results", by Dr. D. McLean. (Tavistock House South (Entrance D), Tavistock Square, London, W.C.1, at 5.30 p.m.)
- 18 April. Royal Institute of Chemistry, London Section. "The Extraction of Germanium and Gallium", by A. R. Powell. (Joint meeting with the Luton Scientific Association.) (Town Hall, George Street, Luton, at 8 p.m.)
- 25 April. Institute of Physics, Midland Branch. "The Strength of Metals", by Dr. A. H. Cottrell. (Regent House, Birmingham, at 7.0 p.m.)

APPOINTMENTS VACANT

CAST IRON RESEARCH

A METALLURGIST is required at the Birmingham Laboratory of THE MOND NICKEL CO., LTD., to do research work on cast irons, including spheroidal graphite cast iron, alloyed white irons, and austenitic corrosion- and heat-resisting irons. Research experience, preferably with ferrous metals, is an essential qualification. Publication of results is encouraged, and salary will be in accordance with experience and qualifications.

Pension and Assurance schemes are in operation, and in appropriate cases assistance can be given for housing. Applications, which will be treated in confidence, should give details of age, qualifications, and experience, and be addressed to The Manager, Development and Research Dept., The Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1. Please mark envelope "Confidential L.39".

CHIEF CHEMIST/METALLURGIST required for non-ferrous laboratory. Duties comprise control of analytical laboratory, heat-treatment, plating department, &c. Staff appointment. Apply, The Wednesbury Tube Co., Ltd., Bilston, Staffs.

HIGH DUTY ALLOYS, LTD., RESEARCH DIVISION, SLOUGH, BUCKS. Experienced light-alloy rolling-mill Metallurgist required to work on research problems associated with production. Applicants should preferably have a degree or its equivalent and several years' experience of the technical control of light-alloy sheet production. The successful candidate will be expected to pay regular visits to the Rolling Division in South Wales and to pursue actively his investigations in the Research Laboratories. This is a senior appointment, and the salary paid will be commensurate with qualifications and experience. There is a pension scheme in operation. Apply, giving full details, to the Staff Manager, address as above.

HIGH DUTY ALLOYS, LTD., RESEARCH DIVISION, SLOUGH, BUCKS. Metallurgist or Physicist required to take charge of the Metallographic and Photographic Sections of the Research Laboratories. Candidates should have a good Honours Degree or its equivalent with several years' experience, including modern metallographic techniques, in the light-alloy or non-ferrous

APPOINTMENTS VACANT

industries. This is a senior appointment, and the starting salary envisaged for a suitably qualified and experienced person is up to £1200 per annum. There is a pension scheme in operation. Candidates should apply, giving full details, to the Staff Manager, address as above.

METALLURGICAL RESEARCH

THE MOND NICKEL CO., LTD., is expanding the section engaged in Melting and Casting research at its Laboratory in Birmingham. Suitably qualified metallurgists are required to conduct investigations in the following fields:

- (1) Study of conventional and novel melting procedures to secure improved control over chemical compositions and mechanical and working properties.
- (2) Development of new alloys having good castability, corrosion-resistance, and mechanical properties.

Successful candidates will join a well-equipped research team which both serves and enjoys the services of other teams studying all aspects of ferrous and non-ferrous alloys.

The vacancies are suitable both for new graduates and for metallurgists having research or production experience. Students sitting for degree examinations in 1957 will be considered. Individual publication of results is encouraged. Salary will be in accordance with experience and qualifications.

Pension and Assurance schemes are in operation, and in appropriate cases assistance can be given for housing. Applications, which will be treated in confidence, should give details of age, qualifications, and experience, and be addressed to The Manager, Development and Research Dept., The Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1. Please mark envelope "Confidential L.40".

METALLURGIST for Central Research Organization to carry out investigations on bearings under service and test conditions. Opportunities for initiative in planning and interpreting experiments, Lab. Exp., H.N.C. (Met.), L.I.M., or equivalent. Starting salary up to £800 p.a. Personnel Officer (Ref. 701), Glacier Metal Co., Ltd., Ealing Road, Wembley, Middx.

METALLURGIST

BRITISH INSULATED CABLES LTD., require a metallurgist for their Wire Mills Division at Prescot for investigational and development work connected with the manufacture of a variety of wrought-metal products in copper and aluminium. Some experience of research or development is desirable, but not essential. Candidates should be qualified to degree standard or equivalent. An attractive salary will be offered commensurate with age, experience, and qualifications. Applications should be addressed to the undersigned quoting P/3/57. STAFF OFFICER, BRITISH INSULATED CABLES LTD., PRESCOT, LANCASHIRE.

METALLURGIST or **METALLURGICAL CHEMISTS**, B.Sc. or equivalent, required for Tin Smelting Works in Singapore and Malaya. Age 22/30. Single. First-class passage and free furnished quarters provided. Provident fund. Salary according to qualifications and experience, but not less than £1200 p.a. Apply giving full details of age, education, qualifications, and experience, National Service, &c., to Box No. 423, The Institute of Metals, 17 Belgrave Square, London, S.W.1.

METALLURGIST required for Laboratory of large Engineering Works in the South Midlands, must possess Honours degree in Metallurgy or equivalent. Main duties consist of scientific control of metallurgical processes and materials and the Company's products. Full details of age, experience, qualifications, &c., to Box No. 425, Institute of Metals, 17 Belgrave Square, London, S.W.1.

METALLURGIST with University degree or equivalent required for investigational work on the welding of non-ferrous metals in metallurgical research department in North London area. Some experience in research or industry desirable; a knowledge of arc welding an advantage but not essential. Excellent salary and prospects for suitable applicant. Apply in writing to Research Manager, Murex Welding Processes, Ltd., Waltham Cross, Herts.

PHYSICIST or X-ray Crystallographer with post-graduate research experience required for fundamental research group in North London laboratories. Experience in metallurgy desirable but not essential. Attractive salary according to age and experience. Apply in writing to Research Manager, Murex Welding Processes, Ltd., Waltham Cross, Herts.

POWDER METALLURGY

THE MOND NICKEL CO., LTD., requires a Metallurgist to work in its Birmingham Laboratory with a team engaged in the development of a wide range of nickel-containing materials, using powder-metallurgical techniques. Applicants should possess an Honours degree or equivalent qualification, preferably have experience in the powder-metallurgy field, and be capable of working on their own initiative. Individual publication of results is encouraged.

Salary will be in accordance with experience and qualifications. Pension and Assurance schemes are in operation and, in appropriate cases, assistance can be given with housing. Applications, which will be treated in confidence, should give details of age, qualifications, and experience and be addressed to The Manager, Development and Research Dept., The Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1. Mark envelope "Confidential L.41".

UNIVERSITY OF NOTTINGHAM

FACULTY OF APPLIED SCIENCE

Postgraduate Studentships and Scholarships

The University offers in the Faculty of Applied Science a number of Postgraduate Studentships and Fellowships for research in the various branches of engineering.

Studentships, of varying values from £300 to £500 per annum plus fees, are open to candidates who by October 1957 will have obtained a good Honours degree in any branch of engineering, metallurgy, mathematics, or physics.

Research Fellowships vary from £600 to £750 per annum plus fees, child allowance, and F.S.S.U. contributions. Candidates for a Fellowship should have a good Honours degree in any branch of engineering, metallurgy, mathematics, or physics, together with either research or industrial experience.

The University will also in due course be making recommendations for the award of D.S.I.R. Studentships to candidates wishing to do research in the University of Nottingham.

Further information and forms of application for all these awards may be obtained from the Registrar. Immediate provisional application will be an advantage. Applications for Postgraduate Studentships and Fellowships will not be accepted after 1 July 1957.

UNIVERSITY OF BIRMINGHAM

Applications are invited for two Grade II LECTURESHIPS (£650-£1350 p.a.) in the DEPARTMENT OF INDUSTRIAL METALLURGY. Candidates should have a suitable degree and industrial or research experience with preferably an interest in the application of scientific principles in the field of melting and casting or in metal working. The persons appointed will lecture to final-year and postgraduate students of metallurgy. The Department offers good facilities for research.

Applications (two copies), with the names of three referees, should be sent as soon as possible to the Registrar, The University, Birmingham 15, from whom further particulars may be obtained.

METALLURGISTS

The Jones & Laughlin Steel Corporation—fourth largest steel producer in the United States—has several openings for exceptionally able metallurgists in its expanding Research and Development Department, involving work in the fields of physical and process metallurgy.

University training in metallurgy, physics, or physical chemistry, either at Ph.D. level or at B.Sc. level with appropriate research experience, is required. Applicants must be definitely interested in research or process development activity—rather than plant or production work.

Location is in Pittsburgh, Pennsylvania, centre of the steel industry in the United States—a city offering outstanding living conditions and cultural advantages.

The Assistant Research Director of J & L—a native of Great Britain—will be in England in the spring of 1957 to talk with candidates.

If interested, kindly send a complete résumé of your education and work experience to:

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